

Careless and ill-informed authors of this class are the terror of systematists in all branches of biology. Their sole object seems to be the association of their names with as many "new species" as possible; and one's first impulse on seeing "A Description of Some New Genera and Species" &c. is to parody "The Bogie Man," and say with bated breath,

Hush! Hush! Hush! Here comes the Species Man.

I will conclude by expressing my hope that Mr. Miller will take my remarks in good part: for he has recently made it very clear that he is extremely sensitive to criticism, more especially to some which appeared in "that conduit of English ignorance and conceit, the 'Annals and Magazine of Natural History,'" and was erroneously attributed by him to

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American Spiders and their Spinning Work. A Natural History of the Orb-weaving Spiders of the United States, with special regard to their Industry and Habits. By HENRY C. MCCOOK, D.D. &c. Published by the Author, Philadelphia. Vols. I. & II. 4to, demy.

THAT second thoughts are best is a saying which, whether true or false in the majority of instances, is undoubtedly deserving of the former epithet so far as the volumes before us are concerned. To write a natural history of all orders of North-American spiders was the author's original wish; but it soon became apparent that the attempt to compress into a reasonable space adequate descriptions of the habits and structure of such a multitude of species would inevitably result in the omission of many important facts and in the superficial treatment of others. Dr. McCook consequently very wisely decided to abandon his original design and to devote his work solely to an account of the Orbitelariæ of his country; and when we see that the history of even this small section of the group occupies three volumes quarto, we cannot but congratulate both ourselves and the author upon the alteration that his plans have undergone.

Up to the present time but two volumes out of the three have appeared; but since the third will treat almost exclusively of the technical descriptions of the genera and species, its publication will be looked forward to by merely those few zoologists who devote themselves to systematic araneology.

Seeing that one of the most notable characteristics of the Araneæ—certainly the characteristic with which the word spider is most commonly associated in the popular mind—is the construction of those familiar objects known as cobwebs, Dr. McCook has acted wisely in setting apart the first of his volumes to the consideration of the various kinds of snares, their formation, function, and classification. Moreover, a study of the nature of the snares is of great importance in view of the prominence that is given to these struc-

tures in the generally-accepted scheme of classification of the order Araneæ. This scheme, of which Dr. Thorell is the most able exponent, depends upon the fact that a classification of the webs according to their form corresponds closely with a classification of the spiders based upon the sum of their most obvious structural features. With the rival scheme*, which is established upon the existence in otherwise dissimilar genera of those curious organs known as the *cribellum* and *calamistrum*—a scheme for which Dr. Bertkau has said all that is to be said—we need not further deal. It will be sufficient to state that Dr. McCook, rightly in our opinion, adopts the views of Dr. Thorell, and associates with the Orbitelariæ the aberrant genera *Uloborus*, *Hyptiotes*, and *Theridiosoma*.

But a noticeable circumstance connected with this matter is that although, as above stated, a natural classification of the webs coincides with a natural classification of their makers, when the Araneæ as a whole are considered, yet the principle is found not to apply if an attempt be made to extend it to the suborder now under discussion. In other words, an obvious classification of the snares of the Orbitelariæ does not correspond with a classification of the species and genera according to their affinities as exemplified by structure. As an illustration of this may be pointed out the fact that within the limits of the genus *Epeira* webs of very different types may be constructed. The commonest type is a simple, vertical, full-orbed net with a meshed hub (*sic*); but in the species known as *Ep. labyrinthica* a system of netted lines is associated with the ordinary web; in *Ep. triaranea* the web is not full-orbed, but lacks one sector; the web of *Ep. gibberosa* is horizontal and not vertical; and, lastly, *Ep. basilica* weaves the remarkable net which Dr. McCook has described as the domed-orb. On the other hand, the web of *Gastracantha* is almost like the web of the ordinary type of *Epeira*; that of *Zilla*, not to mention *Nephila*, resembles that of *triaranea* in lacking a sector; that of *Tetragnatha* is like that of *gibberosa* in being horizontal. It appears, then, that there may be a greater difference between the webs of a species of a genus than between the webs of distinct genera; thus the web of *Epeira basilica* is far more unlike the web of, e. g., *Ep. diademata*, than is the web of *Zilla* or even *Argiope*.

Since, then, the form of the web is liable to so much variation within the limits of a single genus, and since species belonging to different genera may spin snares that are almost exactly alike, it is clear that great caution should be used in concluding that spiders which make webs on a particular plan are necessarily related to each other. But it is impossible to pursue this interesting topic further. Enough has been said to give some idea of, perhaps, what is one of the most important lessons to be learnt from Dr. McCook's researches into the nature of webs.

* For an able and exhaustive criticism of this classification reference may be made to Dr. Thorell's paper in the *Ann. & Mag. Nat. Hist.* vol. xvii. pp. 301-326 (1886).

We are surprised at the summary manner in which the view that spiders attach stones &c. to their webs as so-called counterpoises, is rejected. Dr. McCook is perfectly right to sift as carefully as he has done the evidence for or against the belief; but it is questionable whether he is correct in deciding that the attachment of such a weight would be harmful. Why so? A web blown by the wind would surely be more easily destroyed if all its points were attached to fixed objects, than if one or more strands were fastened to, *e. g.*, a pebble lying on the ground, which would "give," so to speak, when pulled by the strands under stress of the wind. Where something must "give," it is surely better for the spider that it should be the pebble than the web.

In Chap. xvi. of vol. i. Dr. McCook discusses at some length the question of spider venom. He starts with the assumption that the fluid secreted in the mandibles and ejected at the apex of the fang is poisonous. He then proceeds to show that it is perfectly harmless. Numerous cases are cited in support of this, Lucas even having been bitten by *Latrodectus* and Simon by the historical *Tarantula* without suffering harm. It is true that the universal testimony with regard to *Latrodectus* far outweighs almost any amount of negative evidence; and the conclusion that Dr. McCook finally comes to is that the poison is a sparingly used reserve weapon. This may be the case of course; but the explanation is not altogether satisfactory, for it is apparently the only one that can possibly be put forward if we assume the existence of a poison apparatus. But what evidence is there for the assumption? Certainly very little. Why may not the fluid be merely secreted for digestive purposes, such as, *e. g.*, for softening the tissues of the prey? To make a general statement with regard to all spiders from the particular case of *Latrodectus* is not justifiable. It may well be that in this genus the digestive fluid is harmful to man, while in all other spiders it is not. Indeed this seems to us to be the obvious conclusion from the facts at hand. With respect to the Theraphosidae, as Dr. McCook himself suggests, it may well be that the fluid that is injected into a wound causes inflammation from its very amount.

The second volume is much more varied in its subject-matter than the first. Thus Part i. is devoted to Courtship and Mating; Part ii. to Maternal Industry and Instincts; Part iii. to Early Life and Distribution of the Species; Part iv. to Sexes and their relation to Habit; Part v. to Hostile Agents and their Influence; and Part vi. to Fossil Spiders. Frequent reference is made to groups which do not belong to the Orbiculariæ; while the section devoted to Fossil Spiders seems wholly out of place.

Clearly a considerable amount of the work of this volume has been robbed of its novelty by the prior publication on the part of the Peckhams of their articles on Sexual Selection, Protective Resemblances, and Mental Powers in Spiders. One or two points, however, may be noticed.

Commenting on the difference in the behaviour of a *Tarantula* and an *Epeira* when experimented on with a vibrating tuning-fork

—the *Tarantula* taking no notice whatever of the instrument, while the *Epeira* responds readily to it—Dr. McCook says that the difference is certainly to be explained by the fact that the fork agitates the strands of the web of the *Epeira*, and that the spider thereby ascertains its proximity by the sense of touch; he then proceeds (p. 304): “It would indeed be a remarkable fact were it to be established that those spiders which, like the Lycosids, are dependent upon keenness of the senses for their success in capturing prey, should prove to be destitute of the valuable sense of hearing; while the web-making spiders, who are so little dependent upon the sense of hearing, and are enabled to accomplish the most important functions of life by the sense of touch alone, should be found to possess hearing in a degree of acuteness. It is not often that one finds a contradiction like this in natural history, viz. that those animals that most need a certain organism or sense have none, while those which are in least need are highly sensitive.” But if, as Dr. McCook maintains, the *Epeira* only perceives the vibration of the fork by means of the vibration of its web, how comes it that, at all events in some cases, it undoubtedly knows the direction of the sound? We have seen Mr. C. V. Boys hold a tuning-fork over the back of a large specimen of *Epeira diademata*; but instead of feeling at the strands of the web, as she surely would have done if her only means of ascertaining the proximity of the fork lay in the vibration of these strands, she struck viciously at the instrument in the air with her fore legs, thus showing beyond a doubt that she knew whence the sound proceeded. This fact, it seems to us, proves unquestionably that the *Epeira* heard the sound, probably by the responsive agitation of some hair or hairs on the body or limbs; for it is almost inconceivable that the spider’s sense of touch can be sufficiently keen to inform her, in a case like this, of the position of the agitating agent. If this be so, we have to face and account for what Dr. McCook considers a “contradiction in natural history.” For, whether remarkable or not, the simple fact will remain that, so far as we can judge by their actions, the *Epeira* has an auditory sense and a *Lycosa* has it not. But when criticised, this so-called contradiction merely amounts to an assumption, which after all may be but a fiction of the imagination. In the first place it must be remembered that a terrestrial species like a *Lycosa* must prey for the most part upon insects which, ground-lovers like itself, make little or no sound, or at least can only be heard when on the wing and out of the spider’s reach. Therefore an auditory sense would not apparently be of the service to it that Dr. McCook makes out. On the other hand, an *Epeira* feeds almost wholly upon insects which are intercepted by its snare when buzzing on the wing. Consequently it is easily conceivable that some benefit is derived from the possession of a sense which would warn its owner of the approach of prey. But in the second place, it must also be remembered that the capture of prey is not the only necessary in life which might make the existence of an auditory sense beneficial. Avoidance of enemies is at least as important. Now in the chapter devoted to enemies and

their influence we read:—"Perhaps the most persistent and destructive natural enemies of spiders are certain Hymenopterous insects belonging to the large family of wasps . . ." Bearing this in mind, and at the same time remembering that the webs which are exposed for the capture of winged flies must at the same time of necessity be equally exposed to the attacks of the winged and marauding wasps, a close connexion can easily be traced between the existence in the Epeiridæ of an auditory sense and the enemies that attack them. Of course wasps often prey upon ground-spiders like the *Tarantula*; but it does not appear why an auditory sense should be of more use to a *Tarantula* in this connexion than to an *Epeira*. Is not exactly the opposite the case? The *Epeira*, owing to the exposed site of his web, must surely be much more liable to the attacks of wasps than is the *Tarantula*, which spins none. If this be so, then the power to hear would be of more service to the *Epeira* than to the *Tarantula*. Indeed, if the *Epeira* had no such sense, it seems that the advantage gained by the exposure of her snare for the interception of flies would be counter-balanced by the fact that this very method of obtaining her food would, *pari passu*, lay her open to the assaults of her enemies. We cannot then accept Dr. McCook's view of the matter until (1) he bases his objection to the one held by Mr. Peckham, which has been here supported, on something more stable than his "contradiction in natural history," and until (2) he shows how an *Epeira* can discover on which side of her web a vibrating tuning-fork is held, if she is only aware of its proximity through the responsive vibration of her snare.

In an interesting chapter on the ballooning of spiders the author seeks to account for the distribution of the widespread *Heteropoda venatoria* with reference to this habit. Thus it is found that the geographical belt over which this species is spread corresponds tolerably closely with the zone of the trade winds; and it is suggested that we may look upon these winds, in conjunction with the aeronautic habit, as the agents in the dispersal of the species. The suggestion is certainly interesting and at first seems reasonable enough when we recollect that young spiders may be carried to considerable distances through the air when hanging to their silken strands. But it is necessary not to lose sight of the fact that to say that the area of the distribution of a species corresponds with the area of the trades is only another way of stating that the species in question is a tropical one; consequently it is clear that the charts on pp. 269 and 270, explaining the connexion between these winds and the known localities for *H. venatoria*, will apply equally well to many wide-spread species, which certainly have not the means of travelling which are ascribed to this one. Thus we cannot accept Dr. McCook's theory until reasons are brought forward to show that the agencies which have effected the distribution of, e. g., *Isometrus maculatus* or *Scolopendra subspinipes* are inefficient to account for the similar distribution of *Heteropoda venatoria*. What these agents have been must still be a matter for debate.

But Dr. McCook advances certain arguments in an attempt to prove that in the case of *H. venatoria* man, at least, has not been one of them; for we read on p. 269, vol. ii., “. . . the following facts warrant the theory that the Huntsman Spider has become cosmopolitan by the action of nature, independent of the aid of man: first, the early discovery of the species as already widely distributed; second, its presence at so many different insular points nearly or altogether contemporaneously with first visits of commercial nations; third, the existence of the species or its close allies among the fauna of the tropical interiors of continents far distant from coast-lines; fourth, the variations, chiefly in colour, which have been observed, and which would seem to require for their development a longer period than that which has transpired since the commencement of commercial communication with the localities in which the variations have been wrought.”

Each of these arguments, however, is open to criticism—(1 and 2) *H. venatoria* has only been known for about 140 years, having been described by Linnaeus in 1750 or thereabouts. What evidence, then, is there that the species was widely distributed when the world was first circumnavigated 200 years before Linnaeus wrote? Again, supposing that Sir Francis Drake had brought examples of this species from all the localities that his vessel passed on his voyage round the world, what would this have shown? Merely that the distribution of the animal was not to be attributed to him. It would give no information whatsoever to justify the assumption that the spider had not been carried by previous visitors. Or, again, if it was an ascertained fact that *H. venatoria* was an inhabitant of the Antilles when Columbus first made known to Europeans the existence of these islands, would any one have the right to conclude therefrom that the spider had not been introduced there by man? Dr. McCook seems to have lost sight of the fact that this spider may have been carried to the various localities where it is found by far earlier colonists than history has any record of. Was the dingo not introduced into Australia by man because we do not know the date of its first appearance there? (3) What conclusion in support of Dr. McCook's view can possibly be drawn from the fact that the spider is found inland as well as on the coast? What is to prevent such a species from travelling to the interior when once it has effected a landing? Are we to conclude that the common rat and the common cockroach have not been brought to England in ships because they are not confined to our seaport towns? (4) With regard to the proposition respecting the colour variations, it is certain that Dr. McCook would be doing great service to zoology if he would publish what information he possesses on the question of the length of time required for the development of such variations. Undoubtedly evidence should be produced to show that certain varieties occur in certain localities. Otherwise we may well be excused for asking what reasons there are for thinking that the variations in colour are the result of a wide-spread range. It may be characteristic of the species to vary quite apart from its being

widely distributed. That differences in tint are not necessarily connected with distribution, we learn from the case of *Epeira trifolium*, which certainly has not a wide range as compared with *H. venatoria*. The colour variations of the former species are admirably shown on pl. i. of vol. ii. of this work, and on pp. 331 and 332 of the same volume we are told that variations in colour may be connected with moulting, age, gestation, muscular action, and sex. And conversely we are told that variation in environment is not always accompanied by variation in colour; for on p. 334 we read that “. . . certain species, as notably *Argiope cophinaria* and *argyraspis*, have undergone a transeontinental distribution, covering wide extremes of climate and conditions without experiencing any notable change in general appearance.” Consequently it does not appear that the theory propounded with respect to the distribution of *H. venatoria* is established on a very secure basis.

Dr. McCook candidly expresses his belief in death-feigning (p. 444). This phrase, it appears, can only mean that a spider has a knowledge of death, and attempts to simulate the appearance of a dead brother spider in the hopes of deceiving a man or a lizard into the belief that there is no life in his carcase. This is attributing so much intelligence to the little animal that one is tempted to ask, How comes it that such a mind is not also aware that a dead body in that state of preservation is quite as acceptable as a living one to the collector's bottle or the lizard's palate? The hypothesis that the spider's sole thought, if we may use the word, is to “lie low,” or, in other words, to keep still and occupy as small a space as possible, seems far simpler and meets all the facts of the case.

The subjects, however, open to criticism that a work of this kind presents are practically without end. Those that are here put forward are some few that occurred to us the first time of reading over. Many more no doubt remain. But on the whole the volumes are decidedly good, showing much care and thought; and we sincerely hope that ere long Dr. McCook will give us in a similar form the results of his researches into groups other than the Orbitelariæ.

R. I. P.

Catalog der Conchylien-Sammlung, von FR. PAETEL.

Parts II. and III., 1889-1890.

A short notice of the first part of this work appeared in these ‘Annals’ for 1888 (vol. ii. pp. 420-422). The second and third parts, which complete the Catalogue, are now published.

This work, which purports to give a complete list of all the known families, genera, and species of shells, is the most extensive of the kind yet issued. No doubt it will be largely used by collectors who wish to ascertain the extent of their own collections, to mark off desiderata, to find out habitats, names of authors, &c., and as a plan to be followed in the arrangement of their cabinets.

As an assistance to scientific workers, however, it will be of less